King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
STAT-361 Operations Research I [1]
HomeWork 1
Three Questions due March 6^{th}, 2016 [2]

Exercice 1

Given the following linear program:

$$\begin{array}{ll} \min\limits_{x_1,x_2} & 2x_1 + 5x_2 \\ \text{s.t} & 4x_1 + x_2 \leq 5, \\ & x_1 + 2x_2 \geq 4, \\ & x_1, x_2 \geq 0. \end{array}$$

(a) Solve the linear program graphically.

[1] Dr. Slim Belhaiza (c), February 2016
[2] This is NOT a team assignment. Make sure that you submit your answers individually using your own words.

(b) Write the standard form corresponding to the linear program.

(c) Solve the linear program using the Simplex method.

Exercice 2

CellCom, a company producing mobile phones has designed three different models and is intending to commercialize its products in the middle-east region. Based on some data provided by CellCom, you are chosen to elaborate a production plan that would maximize its expected profits on a short period of time.

The three models of mobile phones, called $Z100$, $Z200$ and $Z300$ are assembled in the same factory. The following table shows the amount of time (in minutes) needed to finalize each unit of the three mobile phones in three departments; Assembling, Packing and Administration.

Phone	Assembling	Packing	Admin.	Comp. Cost	Price
$Z100$	5	1	3	10	100
$Z200$	4	2	2	15	150
$Z300$	3	1	2	20	200
Lab. Cost	20	30	60	–	–
Available	100	50	20	–	–

The table also gives the cost per hour of each labour hour, the amount of labour hours available in the three departments, the total cost of the components used for each phone unit (in SAR) and also the suggested commercialization price (in SAR) of each phone unit.

(a) Define all decision variables needed.

(b) Give the objective function to optimize.

(c) Write all the constraints to be statisfied.

(d) Solve the linear program.

Exercice 3

The following Simplex tableau corresponds to the representation of a basic feasible solution of a linear program during its optimization.

c^t	?	?	?	0	0	0		
$Basis$	x_1	x_2	x_3	e_1	e_2	e_3	b_j	$\frac{b_j}{c_{pj}}$
x_1	1	0	1	3	3	0	4	
x_2	0	1	2	2	1	0	2	
e_3	0	0	1	2	2	1	3	
RC	0	0	-2	1	4	0	$z = 12$	

(a) Complete the missing values in the Tableau.

(b) Peform a single pivot iteration in case the objective has to be maximized.

(c) Peform a single pivot iteration in case the objective has to be minimized.

(d) Give a possible original expression of the linear program.

(e) Compute the reduced costs of the variables in case the basis is composed by: x_1, x_3 and e_2.